

one of a push force which drives the boring tool, a temperature of the boring tool, a pressure of a drilling mud that is supplied to the boring tool, a status of a battery used in the boring tool and a proximity of the boring tool to an underground utility.--

REMARKS

Claims 39-96 remain pending in the present application. New Claims 97-104 have been added, which are directed to features which Applicant regards as being inventive, with the full support of the specification as seen, for example, at page 14, lines 1-4. Applicant has amended the claims consistent with the Examiner's § 112 concerns, unless otherwise noted. A new abstract has been provided, as well as a revised copy of Figure 4. The specification has been amended consistent with the Examiner's concerns.

The § 112 Rejections

The Examiner rejected Claims 45, 59, 73 and 87 under 35 USC § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention, specifically referring to an audio indication responsive to a warning received by the portable device. Applicant respectfully disagrees. At page 16, lines 1-3, the specification states that:

[V]irtually anything computed or measured at the drill rig may be transmitted to the locator/controller.

Further, in discussing the drill rig at page 12, lines 9-11, the specification goes on to state that an audio warning may be provided by an alarm 192 (Figures 5 and 6) whenever threshold limits of any of the monitored parameters are violated. Then at lines 12-16 of page 12, immediately after describing the alarm feature, the specification describes locating identical display and indication features in the portable locator. Moreover, the provision of audio at portable locator 36 is undeniably supported by the incorporated Mercer patents. As an example, portable locator 36 is shown in Figure 12 of U.S. patent number 5,155,442 including a beeper 136 for providing audio indications. In this regard, page 7, lines 7-9 of the specification, states:

With exceptions to be noted, locator 140 may be essentially identical to locator 36, as described in the Mercer patents.

Accordingly, Figure 4 has been revised to show alarm 192 of Figures 5 and 6 along with a minor revision of an associated paragraph appearing at page 13, line 20, to page 14, line 20. Applicant, therefore, respectfully requests withdrawal of the § 112 rejection of Claims 45, 59, 73 and 87.

The Examiner rejected Claims 50-52, 64-66, 78-80 and 92-94 under 35 USC § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. The Examiner further states that the subject matter of these claims is not described in the specification nor shown in the drawings. Applicant respectfully disagrees. Applicant notes that these claims encompass limitations relating to monitoring borehole curvature for comparison with the minimum bend radius of the drill string and/or a utility to be installed.

Drill string curvature is clearly shown in Figures 1 and 2 of the present application and is generally a result of steering the boring tool in a well-known way, as described, for example, at page 6, lines 18-21 of the specification.

It is important to understand that Applicant is not claiming to have discovered the existence of these characteristics, nor a technique for determining the curvature of the drill string. In this regard, the minimum bend radius of a drill string or utility to be installed is not determined by Applicant's invention, but is specified by a manufacturer of the drill string or the manufacture of a utility being installed. In contrast, Applicant is claiming a monitoring configuration which establishes a violation of these specified characteristics by comparing the specified minimum bend radii with the curvature or bend of the borehole, as shown in Figure 2, based on monitoring the configuration of the borehole. If the borehole curvature is about to violate either value, a warning may be provided. This monitoring is described in detail in the specification at page 16, lines 8-20. Accordingly, Applicant respectfully requests withdrawal of the § 112 rejection of Claims 50-52, 64-66, 78-80 and 92-94.

The Examiner rejected Claims 39-96 under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicant regards as the invention, further stating that the claims are "replete" with indefiniteness. Applicant respectfully disagrees at least for the reasons given below.

As one example, Claim 39 includes the limitation "at least one operational parameter" and later in the claim recites "the operational parameter." It is noted that Claims 53, 67, 81, 95 and 96 include similar recitations. The Examiner states that "the operational parameter" lacks clear antecedent basis. Applicant disagrees and submits that this exact format of limitation has traditionally been allowed and has recently been allowed on multitudes of occasions. For examples please see: Claim 1 of US Patent No. 6,279,668 reciting "at least one movement command" and referring antecedently thereto as "the movement command"; Claim 6 of US Patent No. 5,961,252 reciting "at least one orientation parameter" and referring antecedently thereto as "said orientation parameter"; and Claim 6 of US Patent No. 5,878,824 reciting "at least one heat generating component" and referring antecedently thereto as "said heat generating component". Moreover, Applicant's understanding of antecedent basis with respect to claim interpretation resides in avoiding confusion. In this regard, it is submitted that the opportunity for confusion using the subject language is extremely remote, if it exists at all, and, in the absence of confusion, such language has consistently been allowed by the USPTO. Accordingly, Applicant respectfully submits that this occasion is no different and that the subject language in the claims should not be disturbed in a way which alters long-accepted standards of practice.

Further considering Claim 39, line 6, the Examiner states that the language:

"for use by said portable device" is confusing because it appears that the operator of the portable device is the one using the "operational data" not the portable device itself.

Applicant is unable to understand the Examiner's meaning. The claim literally says that the portable device is configured for receiving the data signal and that the data signal is for use by the portable device; it says nothing about an operator of the device. One use of the signal is described at page 15, lines 20-23 of the specification wherein the data signal is used in providing push force feedback. Another use of the data signal is described, for example, at page 4, lines 12-13, wherein the data signal is used by the portable device to display the operational parameter. Moreover, it is noted that Figure 4 illustrates "Locator Signal Data" as well as data from Transceiver 146, entering CPU 144 of the portable locator. For at least

these reasons, withdrawal of this § 112 rejection of Claim 39, as well as any rejections of claims including similar limitations, is respectfully requested.

With regard to the Examiner's general assertion that the claims are "replete" with indefiniteness and antecedent basis errors too numerous to mention, Applicant respectfully disagrees after having reviewed the claims. Applicant submits that an extremely literal adherence to antecedent basis results in arcane language that is itself potentially confusing and is not required. In this regard, the Manual of Patent Examining Procedure, Eighth Edition, § 706.03(d) (at page 700-50), discusses imposition of antecedent basis requirements only where the scope of the claim is rendered indeterminate. That is clearly not the case here, since the claims have, in fact, been examined. Further, Section 2173.05(e) of the MPEP, Eighth Edition, states:

Obviously, however, the failure to provide explicit antecedent basis for terms does not always render a claim indefinite. If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite. (referring to Ex parte Porter, 25 UPSQ2d 1144, 1145 (Bd. Pat. App. and Inter. 1992))

Accordingly, amendments have been provided based on suggestions made by the Examiner, and at points identified by Applicant, based on the aforementioned review and in view of MPEP provisions. For example, the dependencies of Claims 49, 63 and 91 have been corrected.

For these reasons, it is respectfully submitted that all of the Examiner's rejections under § 112 have been overcome. If the Examiner still believes certain claims are unacceptable under § 112, Applicant respectfully requests clarification of the rejections.

The § 102 Rejections

The Examiner rejected Claims 39-42, 53-56, 67-70, 81-84, 94 and 96 under 35 USC § 102(b) as being anticipated by US patent number 5,513,710 issued to Kuckes. Applicant respectfully disagrees at least for the reasons set forth below.

Initially considering the invention of Kuckes, the patent disclosure describes a steering and guidance system, rather than a locating system. The system of Kuckes is particularly tailored to the application of drilling underneath obstacles such as rivers or, as an example, buildings. The former is specifically shown in Figure 1 of the patent and described, for example, at column 2, lines 2-13. In this regard, it is worthwhile to note that portable devices such as, for example, walk-over locators may not be usable in certain locating scenarios such as, for example, locating under a tall building or a very large solid object such as a boulder, where one may be generally unable to walk over or through such obstacle.

Still considering the portable device limitation of the rejected claims, examples of such a portable device are seen in the form of portable locator/controller 140 in Figures 2 and 3 of the present application. That is, a portable walk-over device. In attempting to meet this limitation, the Examiner cites item 28 of Kuckes. Applicant respectfully disagrees. Item 28 is described by Kuckes as a "directional controller and computer" that is shown in both figures 1 and 2 of the patent. In both of these figures, the directional controller is interfaced with an item 24 which is described as "conventional surface drilling equipment", at column 3, line 26, of the patent. Applicant finds no discussion of directional controller 28 with regard to portability. Moreover, Applicant further finds no discussion with regard to separating directional controller 28 from

conventional surface drilling equipment 24. Applicant submits that directional controller 28 is, in fact, a control system which is necessarily located at the drill rig of Kuckes. In the absence of any direct teaching to use directional controller 28 in a portable manner, it is submitted that the Kuckes reference fails to anticipate the claimed limitation specifically requiring a portable device. Accordingly, for at least these reasons, it is submitted that claim 39 is allowable over the Kuckes reference.

Another limitation found in claim 39 requires a communication arrangement for transferring the aforementioned data signal from the drill rig to the portable device. Further substantiating Applicant's assertion that directional controller 28 is not a portable device, Applicant finds no teaching, disclosure or reasonable suggestion of a communication arrangement set up between directional controller 28 and conventional surface drilling equipment 24. Applicant submits that no communication arrangement is contemplated by Kuckes precisely for the reason that directional controller 28 is not portable and is co-located with the conventional surface drilling equipment. For all of the foregoing reasons, Applicant submits that claim 39 is clearly patentable over the Kuckes reference and hereby respectfully requests its allowance.

Dependent Claims 40-42, as amended, are each directly dependent from and therefore include the limitations of Claim 39. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 39. Further, each of these dependent claims places additional limitations on Claim 39 which, when considered in its light, further distinguish the claimed invention from the art of record.

For example, amended Claim 40 requires a telemetry link between the drill rig and portable device.

As another example, Claim 41 recites a display arrangement configured for using the data signal for display to an operator of the portable device.

As still another example, Claim 42 requires that the boring tool includes a locating signal transmitter which transmits a locating signal for locating an underground position of the boring tool and that the portable device includes a locating section for receiving the locating signal for use in identifying the underground position of the boring tool.

Claim 53 is an independent claim which reflects the limitations found in previously discussed Claim 39, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 39 over Kuckes are equally applicable to Claim 53. Accordingly, Applicant submits that Claim 53 is allowable over Kuckes for at least the reasons given above relating to the patentability of Claim 39. Allowance of Claim 53 is, therefore, respectfully requested.

Dependent Claims 54-56, as amended, are each directly dependent from and therefore include the limitations of Claim 53. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 53. Further, each of these dependent claims places additional limitations on Claim 53 which, when considered in its light, further distinguish the claimed invention from the art of record. Moreover, Claims 54-56 include limitations which reflect the limitations found in dependent Claims 40-42, as described above. The arguments made above with respect to the patentability of Claims 40-42 are, therefore, equally applicable with respect to the patentability of Claims 54-56 over Kuckes. Accordingly, allowance of Claims 54-56 is respectfully requested.

Claim 67 is an independent claim which reflects the limitations found in previously discussed Claim 39 while requiring that the operational parameter is at least measurable at the drill rig. With regard to this latter limitation, Applicant finds no related disclosure in Kuckes, thereby further compelling the support for patentability of Claim 67 over Kuckes. Additionally, the arguments made above with respect to the patentability of Claim 39 over Kuckes are equally applicable to Claim 53. Accordingly, for all of these reasons, Applicant submits that Claim 53 is allowable over Kuckes. Allowance of Claim 53 is, therefore, respectfully requested.

Dependent Claims 68-70, as amended, are each directly dependent from and therefore include the limitations of Claim 67. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 67. Further, each of these dependent claims places additional limitations on Claim 67 which, when considered in its light, further distinguish the claimed invention from the art of record. Moreover, Claims 68-70 include limitations which reflect the limitations found in dependent Claims 40-42, as described above. The arguments made above with respect to the patentability of Claims 40-42 are, therefore, equally applicable with respect to the patentability of Claims 68-70 over Kuckes. Accordingly, allowance of Claims 68-70 is respectfully requested.

Claim 81 is an independent claim which reflects the limitations found in previously discussed Claim 67, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 67 over Kuckes are equally applicable to Claim 81. Accordingly, Applicant submits that Claim 81 is allowable over Kuckes for at least the reasons given above relating to the patentability of Claim 67. Allowance of Claim 81 is, therefore, respectfully requested.

Dependent Claims 82-84, as amended, are each directly dependent from and therefore include the limitations of Claim 81. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 81. Further, each of these dependent claims places additional limitations on Claim 81 which, when considered in its light, further distinguish the claimed invention from the art of record. Moreover, Claims 82-84 include limitations which reflect the limitations found in dependent Claims 68-70, as described above. The arguments made above with respect to the patentability of Claims 68-70 are, therefore, equally applicable with respect to the patentability of Claims 82-84 over Kuckes. Accordingly, allowance of Claims 82-84 is respectfully requested.

Claim 95 is an independent claim which reflects the limitations found in previously discussed Claim 39. Therefore, the arguments made above with respect to the patentability of Claim 39 over Kuckes are equally applicable to Claim 95. Accordingly, Applicant submits that Claim 95 is allowable over Kuckes for at least the reasons given above relating to the patentability of Claim 39. Allowance of Claim 95 is, therefore, respectfully requested.

Claim 96 is an independent claim which reflects the limitations found in previously discussed Claim 95, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 95 over Kuckes are equally applicable to Claim 96. Accordingly, Applicant submits that Claim 96 is allowable over Kuckes for at least the reasons given above relating to the patentability of Claim 95. Allowance of Claim 96 is, therefore, respectfully requested.

The Examiner rejected Claims 39-43, 48, 49, 53-57, 62, 63, 67-71, 76, 77, 81-85, 90, 91, 95 and 96 under 35 USC § 102(b) as being anticipated by US patent number 5,439,064 issued to Patton. The Examiner states in part that Patton discloses a detection arrangement for monitoring an operational parameter, a portable device configured for receiving a data

signal relating to the operational parameter and a communication arrangement for transferring the data signal. Applicants respectfully disagrees at least for the reasons set forth below.

Initially considering the portable device limitation of Claim 39, the Examiner states that this limitation is met by an "operator's office 12", appearing to be a seven story building in figure 1 of the Patton disclosure and nowhere described as "portable" in the specification, which the Examiner construes, without support from the specification, as a "movable trailer." Indeed, since the disclosure clearly depicts a building, and buildings are the very antithesis of "portable" objects, Patton must be viewed as teaching away from the limitation of transmitting information to a portable device. Moreover, Applicant is unable to find any teaching, disclosure or suggestion reasonably relating to portability in the Patton disclosure.

Applicant submits that a disclosure of an office building cannot reasonably be construed as a disclosure of a "movable trailer"; and that in any event neither office buildings nor movable trailers meet the limitation of "portable," particularly in view of the fact that Applicants are unable to find any suggestion, disclosure or teaching in Patton which is reasonably related to portability. In this light, it is submitted that Patton is ineffective as a reference under § 102, as against the present application. For this reason alone, allowance of Claim 39 over Patton is respectfully requested.

As is also described above with regard to Kuckles, Claim 39 requires a communication arrangement for transferring the data signal from the drill rig to a portable device. Applicant does not find this form of communication arrangement in Patton at least for the reason that Patton fails to disclose a portable device. The only communication device Applicant finds in Patton transmits a signal to a building, rather than a portable, hand-carried device. For all of these reasons, allowance of Claim 39 is respectfully requested.

Dependent Claims 40-43, 48 and 49, as amended, are each either directly or indirectly dependent from and therefore include the limitations of Claim 39. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 39. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 39, further distinguish the claimed invention from the art of record.

For example, amended Claim 40 requires a telemetry link between the drill rig and portable device.

As another example, Claim 41 recites a display arrangement configured for using the data signal for display to an operator of the portable device.

As still another example, Claim 42 requires that the boring tool includes a locating signal transmitter which transmits a locating signal for locating an underground position of the boring tool and that the portable device includes a locating section for receiving the locating signal for use in identifying the underground position of the boring tool.

As yet another example, Claim 43 recites that the system includes a drill string extending from the drill rig to the boring tool configured for receiving a push force applied by the drill rig to move the boring tool in a forward direction and the monitoring arrangement includes a push force sensing arrangement which generates a push force signal for inclusion as at least a portion of said data signal. Applicant does not find this feature in Patton.

As a further example, Claim 48 uses a status of the drilling mud as the operational parameter for inclusion as at least a portion of the data signal. Claim 49 add the further limitation that the portable device is configured to provide an operator warning based on the status of the drilling mud.

Claim 53 is an independent claim which reflects the limitations found in previously discussed Claim 39, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 39 over Patton are equally applicable to Claim 53. Accordingly, Applicant submits that Claim 53 is allowable over Patton for at least the reasons given above relating to the patentability of Claim 39. Allowance of Claim 53 is, therefore, respectfully requested.

Dependent Claims 54-57, 62 and 63, as amended, are each either directly or indirectly dependent from and therefore include the limitations of Claim 53. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 53. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 39, further distinguish the claimed invention from the art of record. Moreover, Claims 54-57, 62 and 63 include limitations which reflect the limitations found in dependent Claims 40-43, 48 and 49, respectfully. The arguments made above with respect to the patentability of Claims 40-43, 48 and 49 are, therefore, equally applicable with respect to the patentability of Claims 54-57, 62 and 63 over Patton. Accordingly, allowance of Claims 54-57, 62 and 63 is respectfully requested.

Claim 67 is an independent claim which reflects the limitations found in previously discussed Claim 39 while requiring that the operational parameter is at least measurable at the drill rig. With regard to this latter limitation, Applicant finds no related disclosure in Patton, thereby further compelling the support for patentability of Claim 67 over Patton. Additionally, the arguments made above with respect to the patentability of Claim 39 over Patton are equally applicable to Claim 67. Accordingly, for all of these reasons, Applicant submits that Claim 67 is allowable over Patton. Allowance of Claim 67 is, therefore, respectfully requested.

Dependent Claims 68-71, 76 and 77, as amended, are each directly either directly or indirectly dependent from and therefore include the limitations of Claim 67. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 67. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 67, further distinguish the claimed invention from the art of record. Moreover, Claims 68-71, 76 and 77 include limitations which reflect the limitations found in dependent Claims 40-43, 48 and 49, respectfully. The arguments made above with respect to the patentability of Claims 40-43, 48 and 49 are, therefore, equally applicable with respect to the patentability of Claims 68-71, 76 and 77 over Patton. Accordingly, allowance of Claims 68-71, 76 and 77 is respectfully requested.

Claim 81 is an independent claim which reflects the limitations found in previously discussed Claim 67, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 67 over Patton are equally applicable to Claim 81. Accordingly, Applicant submits that Claim 81 is allowable over Patton for at least the reasons given above relating to the patentability of Claim 67. Allowance of Claim 81 is, therefore, respectfully requested.

Dependent Claims 82-85, 90 and 91, as amended, are each directly dependent from and therefore include the limitations of Claim 81. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 81. Further, each of these dependent claims places additional limitations on Claim 81 which, when considered in its light, further distinguish the claimed invention from the art of record. Moreover, Claims 82-85, 90 and 91 include limitations which reflect the limitations found in dependent Claims 68-71, 76 and 77, as described above. The arguments made above with respect to the patentability of Claims 68-71, 76 and 77 are, therefore, equally applicable with respect to the patentability of Claims 82-85, 90 and 91 over Patton. Accordingly, allowance of Claims 82-85, 90 and 91 is respectfully requested.

Claim 95 is an independent claim which reflects the limitations found in previously discussed Claim 39. Therefore, the arguments made above with respect to the patentability of Claim 39 over Patton are equally applicable to Claim 95. Accordingly, Applicant submits that Claim 95 is allowable over Patton for at least the reasons given above relating to the patentability of Claim 39. Allowance of Claim 95 is, therefore, respectfully requested.

Claim 96 is an independent claim which reflects the limitations found in previously discussed Claim 95, but in method form. Therefore, the arguments made above with respect to the patentability of Claim 95 over Patton are equally applicable to Claim 96. Accordingly, Applicant submits that Claim 96 is allowable over Patton for at least the reasons given above relating to the patentability of Claim 95. Allowance of Claim 96 is, therefore, respectfully requested.

The § 103 Rejections

The Examiner rejected Claims 43-49, 57-63, 71-77 and 85-91 under 35 USC § 103(a) as being unpatentable over Kuckles. The Examiner states that it would have been considered obvious to one of ordinary skill in the art to modify Kuckles to transmit operational parameters such as push force and drilling mud status from a drill rig to an end user and to transmit a warning when one of these parameters violates a minimum/maximum value. Applicant respectfully disagrees.

All of the subject claims are dependent claims which depend either directly or indirectly from independent claims that were rejected under § 102. Initially, it is noted that Applicant has argued above, with respect to all of these base independent claims, that Kuckles is ineffective as a reference under § 102. Those arguments carry equal force with regard to modification of Kuckles with respect to the § 103 rejections under consideration. Accordingly, for this reason, Applicant respectfully requests withdrawal of the § 103 rejections relying on Kuckles.

Turning to the specific modifications suggested by the Examiner, it is appropriate to note, at this juncture, certain standards which must be met in terms of a proper rejection under § 103. Specifically, it is well-settled in the case law that the mere fact that a prior art structure could be modified to produce the claimed invention does not make the modification obvious, unless the prior art actually suggests the desirability of the modification. *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). For this reason, a rejection under 35 U.S.C. § 103 founded on a combination or modification of references cannot be sustained unless the particular combination or modification is suggested by the prior art itself. The Applicant is not bound to show the absence of such a teaching in the prior art. Moreover, Applicant would have no motivation to make the proposed changes in view of the absence of any suggestion to do so and further in view of the differences between the subject reference and Applicant's invention, as DCI-15C2

discussed with respect to the § 102 rejections. Further, the Examiner asserts that it is well known in the prior art to make the proposed modifications. Applicant respectfully disagrees and is aware of no suggestion in the prior art to make or combine these various features. Again, the mere fact that a modification could be made, falls far short of rising to the level of an affirmative suggestion to actually make the modification.

With the foregoing in mind, Applicant finds no teaching, disclosure or reasonable suggestion in Kuckles relating to monitoring push force, as contemplated by Claim 43. Similarly, providing a warning to a portable device responsive to violation of a minimum or maximum value appears to be entirely absent from Kuckles, as required by Claim 44, as well as such a warning in audio or visual form in Claim 45. Claim 46 recites similar limitations relating to violation of minimum and maximum predetermined values. Claim 47 recites limitations encompassing push force monitoring and warning responsive to violation of maximum push force. Claim 48 encompasses monitoring drilling mud as the operational parameter, while Claim 49 further adds the provision for an operator warning based on the status of the mud. At the same time all of Claims 43-49 depend either directly or indirectly from Claim 39 and are respectfully submitted to be allowable over Kuckles at least for the reasons given above with respect to the rejections under § 102.

Claims 57-63 each depend either directly or indirectly from independent Claim 53 and hence are submitted to be allowable at least for the reasons given above with respect to Claim 53 over Kuckles under § 102. Further, Claims 57-63 reflect limitations similar to those of Claims 43-49, in method form, as described. Accordingly, Claims 57-63 are respectfully submitted to be allowable over Kuckles at least for the reasons given with regard to Claims 43-49.

Claims 71-77 each depend either directly or indirectly from independent Claim 67 and are submitted to be allowable at least for the reasons given above with respect to Claim 67 over Kuckles under § 102. Further, Claims 71-77 reflect the limitations present in Claims 43-49, respectively, and are respectfully submitted to be allowable at least for the reasons given with regard to Claims 43-49.

Claims 85-91 each depend either directly or indirectly from independent Claim 81 and are submitted to be allowable at least for the reasons given above with respect to Claim 81 over Kuckles under § 102. Further, Claims 85-91 reflect the limitations present in Claims 71-77, respectively, in method form and are respectfully submitted to be allowable at least for the reasons given with regard to Claims 71-77.

Applicant respectfully submits that all of the dependent claims, rejected under § 103 over Kuckles, are all allowable over the prior art and encompass remarkable advantages which have not been recognized by the prior art.

The Examiner rejected Claims 44-47, 58-61, 72-75, 86 and 89 under 35 USC § 103(a) as being unpatentable over Patton. The Examiner admits that Patton is silent with respect to transmitting a warning to the portable device when a minimum/maximum operational parameter is violated, but states that it would be obvious to modify Patton to do so. Applicant respectfully disagrees.

Once again, all of the subject claims are dependent claims which depend either directly or indirectly from independent claims that were rejected under § 102. Initially, it is noted that Applicant has argued above, with respect to all of these base independent claims, that Patton fails as a reference under § 102. Those arguments carry equal force with respect to

modification of Patton with respect to the § 103 rejections under consideration. Accordingly, for this reason, Applicant respectfully requests withdrawal of the § 103 rejections relying on Patton.

Turning to the specific rejections under Patton, Applicant finds no teaching, disclosure or reasonable suggestion in Patton relating to providing a warning to a portable device responsive to violation of a minimum or maximum value appears, as required by Claim 44, as well as such a warning in audio or visual form in Claim 45. While the Examiner has asserted that these limitations are obvious modifications of Patton. Applicant disagrees and finds no direct teaching to make the proposed modification, as described above, and as is required to make out a proper rejection under § 103. Claim 46 recites similar limitations relating to violation of minimum and maximum predetermined values. Claim 47 recites limitations encompassing push force monitoring and warning responsive to violation of maximum push force. At the same time all of Claims 44-47 depend either directly or indirectly from Claim 39 and are respectfully submitted to be allowable over Patton at least for the reasons given above with respect to the rejections under § 102.

Claims 58-61 each depend either directly or indirectly from independent Claim 53 and hence are submitted to be allowable at least for the reasons given above with respect to Claim 53 over Patton under § 102. Further, Claims 58-61 reflect limitations similar to those of Claims 44-47, in method form, as described. Accordingly, Claims 58-61 are respectfully submitted to be allowable over Patton at least for the reasons given with regard to Claims 44-47.

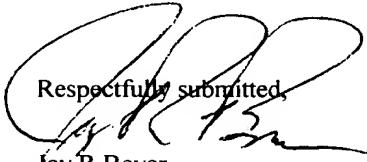
Claims 72-75 each depend either directly or indirectly from independent Claim 67 and are submitted to be allowable at least for the reasons given above with respect to Claim 67 over Patton under § 102. Further, Claims 72-75 reflect the limitations present in Claims 44-47, respectively, and are respectfully submitted to be allowable at least for the reasons given with regard to Claims 44-47.

Claims 86 and 89 each depend directly from independent Claim 81 and are submitted to be allowable at least for the reasons given above with respect to Claim 81 over Patton under § 102. Further, Claims 86 and 89 reflect the limitations present in Claims 44 and 47, respectively, in method form and are respectfully submitted to be allowable at least for the reasons given with regard to Claims 44 and 47.

Applicant respectfully submits that these dependent claims, rejected under § 103 over Patton, are all allowable over the prior art and encompass remarkable advantages which have not been recognized by the prior art.

For the foregoing reasons, it is respectfully submitted that all of the Examiner's objections have been overcome and that the application is in condition for allowance. Hence, allowance of these claims and passage to issue of the application are solicited.

If the Examiner has any questions concerning this case, the Examiner is respectfully requested to contact me at the number set out below.


Respectfully submitted,
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SUPPLEMENT A

In the Specification

A marked-up version of the paragraph replaced at page 9, line 14 carrying over to page 10, line 4, line 18, appears as follows:

Having established a desired steering direction, operator 141 monitors an actual roll orientation indicator 162. As described in the Mercer patents, roll orientation may be measured within the boring tool by a roll sensor (not shown). The measured roll orientation may then be encoded or impressed upon locating signal [90] 98 and received by locator/controller 140 using antenna 126. This information is input to CPU 144 as part of the "Locator Signal Data" indicated in Figure 4. CPU 144 then causes the measured/actual roll orientation to be displayed by actual roll orientation indicator 162. In the present example, operator 141 can see that the actual roll orientation is at the 2 o'clock position. Once the desired roll orientation matches the actual roll orientation, the operator will issue an advance command by moving joystick 148 forward. Advancement or retraction commands for the boring tool can only be maintained by continuously holding the joystick in the fore or aft positions. That is, a stop command is issued when joystick 148 is returned to its center position. If the locating receiver were accidentally dropped, the joystick would be released and drilling would be halted. This auto-stop feature will be further described in conjunction with a description of components which are located at the drill rig.

A marked-up version of the paragraph replaced at page 12, lines 9-22, appears as follows:

Still referring to Figures 2 and 5, the forward, stop and retract command indications eliminate the need for other forms of communication between the drill rig operator and the locator/controller operator such as the walkie-talkies which were typically used in the prior art. At the same time, it should be appreciated that each time a new command is issued from the locator/controller, an audible signal may be provided to the drill rig operator such that the new command does not go unnoticed. Of course, the drill rig operator must also respond to roll commands according to roll orientation display 154 by setting the roll of the boring tool to the desired setting. In this regard, it should be mentioned that a second arrangement (not shown) of components at the drill rig may be implemented with a transmitter at the locator/controller in place of transceiver [152] 146 and a receiver at the drill rig in place of transceiver 106 so as to establish a one-way telemetry link from the boring tool to the drill rig. However, in this instance, features such as operations status display 174 and drill string status display 164 cannot be provided at the locator/controller.

A marked-up copy of the paragraph replaced from page 12, line 24, carrying over to page 13, line 18, appears as follows:

It should be appreciated that the first and second component arrangements described with regard to FIG. 5 contemplate that the drill rig operator may perform tasks including adding or removing drill pipe sections 88 from the drill string and monitoring certain operational aspects of the operation of the drill rig. For example, the drill rig operator should insure that drilling mud (not shown) is continuously supplied to the boring tool so that the boring tool does not overheat
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whereby the electronics packaged housed therein would be damaged. Drilling mud may be monitored by the drill rig operator using a pressure gauge or a flow gauge. As another example, the drill rig operator may monitor the push force being applied to the drill string by the drill rig. In the past, push force was monitored by "feel" (i.e., reaction of the drill rig upon pushing). However, push force may be directly measured, for instance, using a pressure or force gauge. If push force becomes excessive as a result of encountering an underground obstacle, the boring tool or drill string may be damaged. As a final example, the drill rig operator may monitor any parameters impressed upon locating signal 98 such as, for instance, boring tool temperature, battery status, roll, pitch and proximity to an underground utility. In this latter regard, the reader is referred to U.S. [application serial no. 08/643,209] Pat. No. 5,757,190 entitled A SYSTEM INCLUDING AN ARRANGEMENT FOR TRACKING THE POSITIONAL RELATIONSHIP BETWEEN A BORING TOOL AND ONE OR MORE BURIED LINES AND METHOD which is incorporated herein by reference.

A marked-up copy of the paragraph appearing at page 13, line 20, to page 14, line 20, appears as follows:

Referring to Figure 5, another feature may be incorporated in the first and second component arrangements which is not a requirement, but which nonetheless is highly advantageous with regard to drill rig status monitoring performed by the drill rig operator. Specifically, a rig monitor section 190 may be included for monitoring the aforementioned operational parameters such as drilling mud, push force and any other parameters of interest. As previously described, proper monitoring of these parameters is critical since catastrophic equipment failures or damage to underground utilities can occur when these parameters are out of range. In accordance with this feature, processor 114 receives the status of the various parameters being monitored by the rig monitor section and may provide for visual and/or aural indications of each parameter. Visual display occurs on operations status display 174. The display may provide real time indications of the status of each parameter such as "OK", as shown for drilling mud and push force, or an actual reading may be shown as indicated for the "Boring Tool Temperature". Of course, visual warnings in place of "OK" may be provided such as, for example, when excessive push force is detected. Audio warning may be provided by an alarm 192 in the event that threshold limits of any of the monitored parameters are violated. In fact, the audio alarm may vary in character depending upon the particular warning being provided. It should be mentioned that with the two-way telemetry link between the drill rig and locator/controller according to the aforescribed first component arrangement, displays 164 and 174 may advantageously form part of overall display 150 on locator/controller 140, as shown in Figure 4, which may also include alarm 192. However, such operational status displays on the locator/controller are considered as optional in this instance since the relevant parameters may be monitored by the drill rig operator. The full advantages of rig monitor section 190 and associated operations status display 174 will come to light in conjunction with a description of a fully automated arrangement to be described immediately hereinafter.

In the Claims

A marked-up copy of the amended claims is provided immediately hereinafter.

40. (once amended) The monitoring arrangement of Claim 39 wherein said communication arrangement includes a telemetry link between the detection arrangement at the drill rig and the portable device for transferring the data signal to the portable device.

49. The monitoring arrangement of claim [39] 48 wherein said portable device is configured to provide an operator warning based on the status of said drilling mud.

54. (once amended) The method of Claim 53 including the step of providing a telemetry link between the detection arrangement at the drill rig and the portable device and said transferring step includes the step of using the telemetry link for transmitting the data signal to the portable device.

63. (once amended) The method of claim [53] 62 including the step of issuing an operator warning using the portable device based on the status of said drilling mud.

68. (once amended) The monitoring arrangement of Claim 67 wherein said communication arrangement includes a telemetry link between the detection arrangement at the drill rig and the portable device for transferring the data signal to the portable device.

82. (once amended) The method of Claim 81 including the step of providing a telemetry link between the detection arrangement at the drill rig and the portable device and said transferring step includes the step of using the telemetry link for transmitting the data signal to the portable device.

91. (once amended) The method of claim [81] 90 including the step of issuing an operator warning using the portable device based on the status of said drilling mud.